

## **P2 PROJECTS – Other Large-Scale** **CHRONOLOGICAL ORDER**

(Some repeated in other pertinent chrono lists – e.g. hazardous chemical replacements)

### **Successes:**

- 1960s to present - **Solar Dynamic (SD) Power** uses the sun's thermal energy to produce mechanical energy; electricity is then generated from the mechanical energy. GRC has investigated various SD systems for space applications. Since development costs for SD were high and there wasn't a lot of in-space operations occurring, the baseline became a conventional **photovoltaic/battery** system for the space station. <http://space-power.grc.nasa.gov/ppo/projects/sdp/>

- **HISTORICAL WORK @ GRC:** Per Wai Wan, in the '70s & early '80s we had a small hand in ozone layer studies and synthetic fuel testing, during the Carter environmental years. Checking with Dave Kuivinen, Gilbert Boyd who is retired, David DeFelice.

- December 2001: **Oxygen Cleaning - ODC replacement** – The Engine Components Research Lab needed a healthier and more environmentally friendly way of cleaning their 4-inch diameter, stainless steel, hi-pressure oxygen supply line. They had used trichlorofluoroethane (CFC 113), dichlorofluoroethane (HCFC-141B), or 1,1,1-trichloroethane (TCE), all of which deplete the ozone layer. White Sands Testing Facility (WSTF) came up with a replacement: they cleaned the interior of the pipe with heated OAKITE-33 (phosphoric acid and butoxyethanol) acid solution, rinsed with deionized water, then flushed with a basic OAKITE solution. The final rinse used deionized water, HFE-7100 was used to verify cleanliness, and then heated nitrogen gas was used to dry the pipe. (see also hazardous chemical replacements). Involved: Dallas Jenkins, Colman Zsiros, Christie Myers.

- Summer 2002: **EPP Instruction Manual:** A 52+-page guide for evaluating environmentally preferable products for purchase. Involved: Linda Sekura, Walt Kocher

- Summer 2002 to present: **Reference Resource:** A list of over 100 website references was produced in the making of the above EPP Manual, and more are added as the process continues. Valuable links are provided to information on: Chemical evaluations, hazardous chemical lists, P2 sites, MSDS interpretation, terminology definitions, and regulations, among others. Updates are ongoing. Involved: Linda Sekura.

- Summer 2002 to present: **Lessons learned:** Also in the making of the EPP Manual, compiled a list of lessons learned about standard cleaning chemicals, and their benefits and consequences, cleaning product company practices, health issues, unforeseen environmental issues, etc. Updates are ongoing. Involved: Linda Sekura.

- Summer 2002: **Scoring Worksheets and Product Listings:** Master scoring worksheets completed. Being moved to web-based analysis. Involved: Linda Sekura, Walt Kocher
- February 2003: **Chemical Supplies** (Bldg 21): Reduced stored chemicals – moved to a more just-in-time process. Also open to replacing electrical contact cleaners and defluxers in stock with EPP products. Involved: Jeanine Hanzel.
- August 2003 – **AP/EPP lists:** As a FY03 goal, needed to complete and publish lists for **7 application categories**. As of August, **10 lists** are posted on the P2 website. Involved: Linda Sekura, Sandy Jacobson.
- September 2003: **Chemical Management PDA pilot project:** The CMT revamped the chemical inventory process so building personnel can keep records up-to-date with PDA technology versus the old 2-3 year process. Enables “just in time” ordering. Also enables a site for chemical exchange. Electronic access to daily IFM records was obtained, completing the cradle-to-grave aspect of the inventory system. The goal is a site-wide inventory. Involved: Bill Muscolo.
- September 2003: **LCA program developed** – LCA chapter has been submitted. ODCs to be addressed first – Walt Kocher focusing on ozone depleters with Christie Myers. Checking with industrial heating and chilling contact to find what the projects are. The LCA chapter was published during September 2003. Involved: Walt Kocher.
- December 2003: **Plum Brook Chemical Reduction** – PBS has reduced hazardous chemical inventories in five sites, and can now discuss the possibility of implementing the P2 Committee’s new chemical inventory procedure. Reducing chemicals in storage reduces the chance of accidental release, contributing to environmental and worker protection. Plus, it frees storage space and reduces the time it takes to do an inventory. Implementing the new chemical inventory process will allow for “just in time” ordering, reduce the need to guess at requirements at the start of each year, and enable participation in a Chemical Exchange website for sharing of excess chemicals. (See also Hazardous Chemical Replacement.) Involved: Bob Lallier.

## **Work in Progress:**

- 1998 to present: **Test nuclear reactor decommissioning** - There are some facilities at Plum Brook Station that have remained closed, such as the Reactor Facility, which was designed to study the effects of radiation on materials used in space flight. NASA plans to completely decommission the Reactor Facility by 2007 and enable this area to be safely reused. Facts: <http://www.grc.nasa.gov/WWW/pbrf/facts.htm>. Community Information Bank: [http://www.grc.nasa.gov/WWW/pbrf/com\\_info\\_bank.htm](http://www.grc.nasa.gov/WWW/pbrf/com_info_bank.htm). Main site: <http://www.grc.nasa.gov/WWW/pbrf/>. Involved: Bob Lallier.
- 2002 to present: **Real Time Monitoring System (RTMS):** The RTMS environmental sensor system has with wide-ranging possibilities. The RTMS can use any operating

system and can be adapted to any type of sensor. Field testing is needed, and grant money is needed to accomplish this. Some applications: Water monitoring, air monitoring, security and emergency response, wetland chemical cycling, etc. A \$2.5 million grant proposal written up by Walt Kocher was submitted to the National Science Foundation.

Other possible applications:

- July 2003: Metasystems - possible new customized RTMS applications for computer systems (**military personnel sensors** – location, health, etc.). Walt Kocher and Steve Belovich met with Metasystems to discuss.

- July 2003: Stu Schwartz, from CSU's Center for Environmental Science, Technology, and Policy, has opportunities in the **CVNP** for wetland inventory and restoration involving management and ecological issues, especially in hydrology monitoring, and nutrient flows and chemical transformations which occur in small zones (even centimeters). Stu would like to mount a unit on a phone pole and monitor, in fifteen minute intervals, changes in the water table, versus using a satellite that doesn't give a clear picture. Stu is also interested in bispectral imagery, visible and infrared.

(See also Biological Conservation.) Involved: Walt Kocher.

- June 2002 to present: **Garnet recycling system in Fabrication Shop** – A prototype has been developed by the Environmental Management Office, the Fabrication Shop, and a CSU international student. This prototype recycles garnet and water used in operation of the Fab Shop's water knife. Final adjustments are being made to the system. This recycling water knife system may also be used on other water knife systems around GRC and at other centers. (See also Recycling.) Involved: Amarin Kongtawelert, Walt Kocher.

- Summer 2002 to present: **Airport expansion / Class 3 wetlands**: A Cleveland Hopkins airport runway was extended to 9,000 feet. In order to do this, about a mile of an Abram Creek tributary was filled in, which affected a class 3 wetlands. Mitigation is needed to make up for the loss of wetlands. Also, buildings were razed, landfills capped, and hazardous waste and contaminated soils disposed of. 1.3 million pounds of steel was recycled in the process. See website write-up for more details. (See also recycling and biological conservation.) Involved: Don Easterling, Priscilla Mobley, Mike Blotzer.

- Spring 2003 - A CSU student has started a "**SAGE**"-type intelligent P2 program. Users will enter specifications for a product, such as a light-duty cleaner, and the program will respond with a listing of AP/EPP products to choose from. Involved: Zhiguo Jiang, Walt Kocher, Linda Sekura.

- May 2003: An effort is being made to solicit input from Support Service Contractors so that their **chemical purchases can be tracked in the Chemical Management System inventory** database. The decision hinges on whether or not the contractors' orders can be put into the IFM system, and the second hurdle will be the logistics. Involved: Mike Quintin, Sandy Valenti.

- June 2003: **Rewrote the EPP Scoring Instructions Manual** to include rating criteria breakdowns within each of the life cycle stages of Raw Material, Manufacturing, and Use. Involved: Linda Sekura, Walt Kocher.

- Summer 2003: **Cafeteria – Styrofoam and plastic replacement** – India Pettus obtained pricing from Dixie and others for simulated recycled paper foam and plant starch (corn, potato, wheat, rice) biodegradable, or hemp/sugar cane or lime supplies. Mark Betlejewski is open to discussing alternatives to foam plates, cups, and containers. Some alternatives may suit their needs, and pricing is being obtained. Testing will begin once funding is acquired from HQ.

- July 2003: Also the water area used to use amber plastic cups, and now use foam. Considering education/posters to resolve issues (if walk-aways), or replacing with EPP products. There is a safety issue with glass and plastic cups. (See also hazardous chemical replacement). Involved: Mark Betlejewski, Linda Sekura.

- Summer 03: **AP/EPP Website** – Funding is needed for Mike Wagner to complete programming for the website. Linda is putting together manual listings in meantime. Programming will include an **EPP scoring question sheet** for ease of use. Involved: Linda Sekura, Mark Wagner.

- July 2003: Mike Bajorek has a **2000-gal oil-water separator** that could possibly be used at Plum Brook's SPF to help protect Kuebelar Ditch. (See also Hazardous Waste Events.) Involved: Bob Lallier, Mike Bajorek.

- July 2003: **Flywheels** - Members of the P2 Team met with NASA personnel wishing to conduct flywheel research in Bldg 333. EMO will supply the researchers with \$100K in funding for the project. W. Kocher will train them in LCA (including cost). A life cycle study will be conducted in connection with this project. Involved: Walt Kocher.

Linda Sekura X3-5693  
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